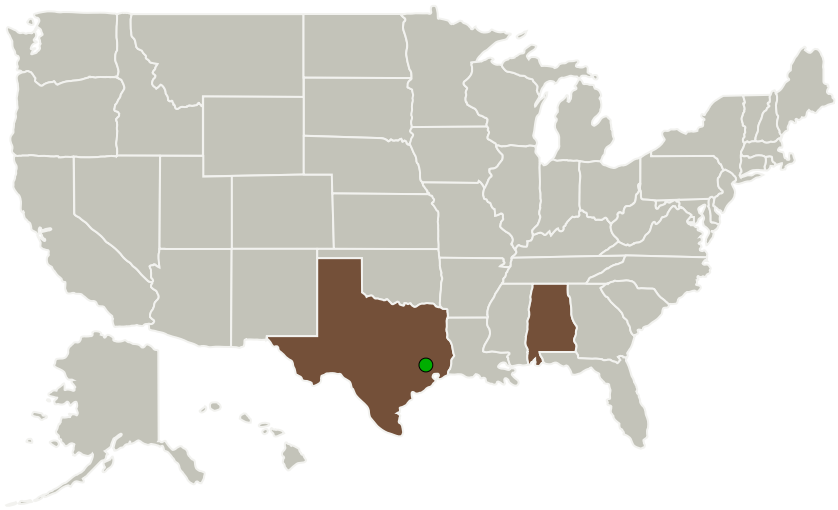
Thermo-Catalytic Ignition of Cryogenic Oxygen-Methane, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Liquid oxygen and methane propellants for in space chemical propulsion of future space exploration vehicles is desired for increased performance and elimination of toxicity of conventional hypergolic storable propellants. LOX/LCH4 propulsion systems may reduce space vehicle design complexity and inert mass by utilizing commodities common with other vehicle systems (e.g., oxygen for life-support systems, methane for solid-oxide fuel cell power). Methane can be produced through the Sabatier process from CO2 and water recovered from spacecraft life support systems and, or in-situ resource utilization technologies. SpaceX, Blue Origin, and other companies are developing methane/oxygen engines for launch vehicles. All types of liquid oxygen/liquid methane engines need to be provided with safe and reliable ignition systems. The majority of current ignition systems use heavy spark torch igniters. Spark torch igniter systems require high voltage electronics to generate the spark which may interfere with other spacecraft electronics. Catalytic ignition significantly reduces energy requirements in comparison with other methods. Plasma Processes proposes an investigation of thermo-catalytic ignition of cryogenic methane-oxygen and the development of an ignition system using innovative nanocrystal catalysts on high temperature metal foams. This catalyst was successfully used for ignition of advanced non-toxic AF-M315E monopropellant in a 100lbf class engine.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Alabama	Texas

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Thermo-Catalytic Ignition of Cryogenic Oxygen-Methane, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139524)*

Images

Briefing Chart Image
Thermo-Catalytic Ignition of Cryogenic Oxygen-Methane, Phase I
(https://techport.nasa.gov/image/128979)

Project Management

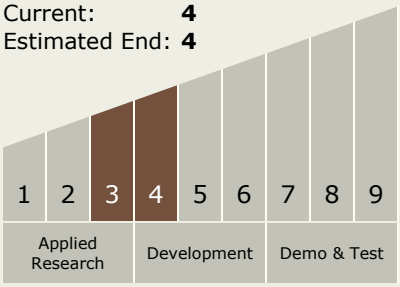
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Timothy N Mckechnie

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System